# A single phase, red emissive $Mg_2SiO_4:Sm^{3+}$ nanophosphor prepared via rapid propellant combustion route

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**Abstract**

$Mg_2SiO_4:Sm^{3+}$ (1-11 mol %) nanoparticles were prepared by a rapid low temperature solution combustion route. The powder X-ray diffraction (PXRD) patterns exhibit orthorhombic structure with α-phase. The average crystallite size estimated using Scherer's method, W-H plot and strain-size plots were found to be in the range 25-50 nm and the same was confirmed by Transmission electron microscopy (TEM). Scanning electron microscopy (SEM) pictures show porous structure and crystallites were agglomerated. The effect of $Sm^{3+}$ cations on luminescence of $Mg_2SiO_4$ was well studied. Interestingily the samples could be effectively excited with 315 nm and emitted light in the red region, which was suitable for the demands of high efficiency WLEDs . The emission spectra consists of four main peaks which can be assigned to the intra 4-f orbital transitions of $Sm^{3+}$ ions $^4G_{5/2}\rightarrow{}^6H_{5/2}$ (576 nm), $^4G_{5/2}\rightarrow{}^6H_{7/2}$ (611 nm), $^4G_{5/2}\rightarrow{}^6H_{9/2}$ (656 nm) and $^4G_{5/2}\rightarrow{}^6H_{11/2}$ (713 nm). The optimal luminescence intensity was obtained for 5 mol % $Sm^{3+}$ ions The CIE (Commission International de I'Eclairage) chromaticity co-ordinates were calculated from emission spectra, the values (0.588, 0.386) were close to the NTSC (National television standard committee) standard value of red emission. Coordinated color temperature (CCT) was found to be 1756 K. Therefore optimized $Mg_2SiO_4:Sm^{3+}$ (5 mol %) phosphor was quite useful for solid state lighting.

**Keywords**: $Mg_2SiO_4:Sm^{3+}$, Combustion technique, Nanophosphor, Photoluminescence, WLEDs, Solid state lighting.

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